

SHOCKING NEWS: IT'S A BUMP BUSTER!

The world's first bicycle shock with a "brain" cushions against jolts, allowing peddlers to blast down trails with greater control and safety.



■ The world's first bicycle shock with a "brain," Smart Shock (pictured above) maintains control in all speed and terrain extremes by compensating for any impact in the blink of an eye.



■ A bicyclist (pictured above) may feel no fear using Smart Shock.

Mountain bikers already wear safety gear to soften their falls, but now they can buy something much more comforting: a bicycle shock with a "brain." No need to think when using it—this computer-controlled suspension automatically adjusts from hard to soft to provide a smoother ride. It allows mountain bikers to concentrate on riding, not on bracing for bumps.

Active Control eXperts, Inc. (ACX; Cambridge, MA), in conjunction with K2 BIKE and Noleen Shocks, developed the cutting-edge "Smart Shock" technology. Capable of compensating for any impact in the blink of an eye, the Smart Shock not only increases overall ride comfort but keeps the front wheel in contact with the road, which helps riders maintain control across all speeds and terrains. Better yet, it only requires a single nine-volt battery to operate and weighs less than a pound.

Using microprocessor, piezoelectric actuator, and sensor technologies, the Smart Shock is the first to provide continuously variable damping. Once activated, the chip allows the damping system to establish its nominal setting. As long as the shock piston does not travel too far down the shaft—that is, when the bike is speeding over smooth or slightly bumpy terrain—the chip will tell the sensor to provide a series of nominal and soft damping forces. The sensor, in turn, signals the actuator system to adjust the shock damping.

If the shock piston travels further down the shaft, as in the case of a big hit, the sensor sounds the alarm and the microprocessor initially adds soft damping to cushion the blow and then hard damping to prevent the shaft from bottoming out. With the sensor monitoring the speed and position of the shock piston about 1,000 times per second, Smart Shock can handle any kind of trail condition on the fly.

Metal sandwich. The sensor technology is based on the giant magnetoresistive (GMR) effect, in which metals show slight changes in electrical resistance when placed in a magnetic field. Sandwiches made up of very thin layers of metals can amplify this effect. Seeing the potential of this technology to dramatically increase the sensitivity of sensors, Nonvolatile Electronics, Inc. (NVE; Eden Prairie, MN), developed novel GMR material and processing technology with funding from BMDO's SBIR program in the early 1990s.

Since then, NVE has leveraged this research into a line of magnetic sensing products with widespread applications. For example, Nu-Metrics (Scottsdale, AZ) is selling Groundhog® and Hi-Star traffic monitors that use NVE's GMR sensors to obtain real-time traffic data, such as traffic speed and volume, types of vehicles, and distances between vehicles. In addition, NVE's GMR sensors are being used in medical instruments, paint spraying-equipment, and automatic braking systems for automobiles. But perhaps the most interesting consumer application to date has been the mountain bike suspension system, Smart Shock.

"Smart Shock has a distinct advantage over conventional manually adjusted shocks," says Matt Miller, K2 BIKE's marketing services manager. "With conventional shocks, once you set it, you're stuck—unless you get off the bike to change it. With the Smart Shock, however, no adjustment is necessary because the microprocessor does it for you instantaneously."

Smart mode. The Smart Shock has three modes of operation: soft, hard, and smart. Soft mode provides lower damping, giving a plusher ride at low speeds. Hard mode provides greater damping, giving a firmer ride at high speeds or while biking uphill. Smart mode is the best of both worlds, providing a variable level of damping over a wide range of terrain conditions and speeds. Bike riders can toggle each mode using a button on a handlebar-mounted box.

The Smart Shock marks the first high-volume, commercial application of electronics to mountain bike suspensions. This innovation is now available on K2's 1998 full-suspension bikes, which cost between \$2,000 and \$4,000. "We are expecting a huge market response to this product," says Adam Bogue, ACX's vice president of marketing. He also mentioned that ACX is working on next-generation bicycle products that offer even smoother and more efficient rides.

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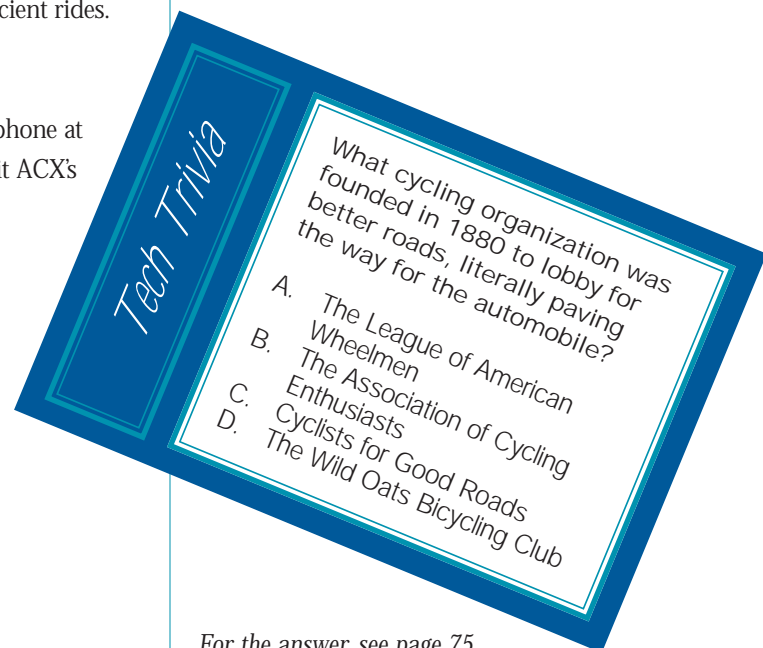
What Does It Mean to You?

Smart Shock was developed for mountain bikers who want maximum comfort and control on rugged terrains.



What Does It Mean to Our Nation?

Electronic suspension systems will help millions of Americans to enjoy the health, recreational, and pollution-prevention benefits of bicycling.



For the answer, see page 75.